

WHAT IS CLAIMED IS:

1. A process for preparing an enantiopure 1,3-dioxolan-4-one derivative or an enantiopure 1,3-oxathiolan-5-one derivative, which comprises

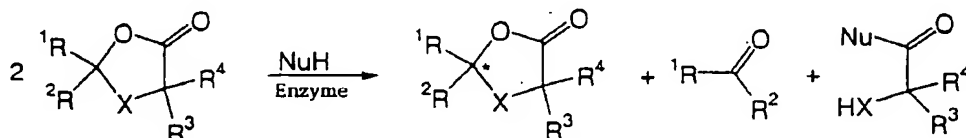
bringing a mixture containing a substance selected from the group consisting of an enantiomeric 1,3-dioxolan-4-one derivative and an enantiomeric 1,3-oxathiolan-5-one derivative and an enzyme with hydrolytic activity into contact in the presence of a nucleophile; cleaving a ring of one enantiomer selected from the group consisting of the 1,3-dioxolan-4-one ring and the 1, 3-oxathiolan-5-one ring by the enzyme with hydrolytic activity; and,

after the cleaving of one enantiomer has taken place, isolating an uncleaved enantiomer selected from the group consisting of the 1,3-dioxolan-4-one derivative and 1,3-oxathiolan-5-one derivative.

2. The process as claimed in claim 1,

wherein the mixture containing a substance selected from the group consisting of the enantiomeric 1,3-

dioxolan-4-one derivative and the enantiomeric 1,3-oxathiolan-5-one derivative is cleaved by means of an enzyme which is able to cleave an ester linkage in the presence of a nucleophile (NuH) as depicted in the equation,



Equation 5

where X = oxygen or sulfur and

the radicals R<sup>1</sup> and R<sup>2</sup> are different and are selected independently of one another from the group consisting of H, substituted or unsubstituted C<sub>6</sub>-C<sub>18</sub>-aryl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl, C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>2</sub>-C<sub>18</sub>-alkynyl, C<sub>6</sub>-C<sub>18</sub>-aryl-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>6</sub>-C<sub>18</sub>-aryl-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>1</sub>-C<sub>18</sub>-alkoxy-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>18</sub>-alkoxy-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>6</sub>-C<sub>18</sub>-aryloxy-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>6</sub>-C<sub>18</sub>-aryloxy-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>2</sub>-C<sub>18</sub>-alkenyl, and CR<sup>8</sup>R<sup>9</sup>-O<sub>n</sub>-(CO)<sub>m</sub>-R<sup>10</sup> and

the radicals R<sup>3</sup> and R<sup>4</sup> are selected independently of one another from the group consisting of substituted or

unsubstituted  $C_6-C_{18}$ -aryl,  $C_3-C_{18}$ -heteroaryl,  $C_1-C_{18}$ -alkyl,  $C_2-C_{18}$ -alkenyl,  $C_2-C_{18}$ -alkynyl,  $C_6-C_{18}$ -aryl- $C_1-C_{18}$ -alkyl,  $C_3-C_{18}$ -heteroaryl- $C_1-C_{18}$ -alkyl,  $C-C_{18}$ -aryl- $C_2-C_{18}$ -alkenyl,  $C_3-C_{18}$ -heteroaryl- $C_2-C_{18}$ -alkenyl,  $C_1-C_{18}$ -alkoxy- $C_1-C_{18}$ -alkyl,  $C_1-C_{18}$ -alkoxy- $C_2-C_{18}$ -alkenyl,  $C_6-C_{18}$ -aryloxy- $C_1-C_{18}$ -alkyl,  $C_6-C_{18}$ -aryloxy- $C_2-C_{18}$ -alkenyl,  $C_3-C_8$ -cycloalkyl,  $C_3-C_8$ -cycloalkyl- $C_1-C_{18}$ -alkyl, and  $C_3-C_8$ -cycloalkyl- $C_2-C_{18}$ -alkenyl or

the radicals  $R^3$  and  $R^4$  form, together with the carbon to which they are bonded, an unsubstituted or substituted or a heteroatom-containing cycloalkylidene and

Nu is  $OR^5$ ,  $SR^5$  or  $NR^6R^7$ , where

the radical  $R^5$  is selected from the group consisting of H, substituted or unsubstituted  $C_1-C_{18}$ -alkyl,  $C_2-C_{18}$ -alkenyl,  $C_2-C_{18}$ -alkynyl,  $C_6-C_{18}$ -aryl- $C_1-C_{18}$ -alkyl,  $C_3-C_{18}$ -heteroaryl- $C_1-C_{18}$ -alkyl,  $C_6-C_{18}$ -aryl- $C_2-C_{18}$ -alkenyl,  $C_3-C_{18}$ -heteroaryl- $C_2-C_{18}$ -alkenyl, and

the radicals  $R^6$  and  $R^7$  are selected independently of one another from the group consisting of H, substituted or unsubstituted  $C_1-C_{18}$ -alkyl,  $C_2-C_{18}$ -alkenyl,  $C_2-C_{18}$ -alkynyl,  $C_6-C_{18}$ -aryl,  $C_3-C_{18}$ -heteroaryl,  $C_6-C_{18}$ -aryl- $C_1-C_{18}$ -alkyl,  $C_3-C_{18}$ -heteroaryl- $C_1-C_{18}$ -alkyl,  $C_6-C_{18}$ -aryl- $C_2-C_{18}$ -alkenyl, and  $C_3-C_{18}$ -

heteroaryl-C<sub>2</sub>-C<sub>18</sub>-alkenyl

and the radicals R<sup>8</sup> and R<sup>9</sup> are selected independently of one another from the group consisting of substituted or unsubstituted C<sub>6</sub>-C<sub>18</sub>-aryl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl, C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>2</sub>-C<sub>18</sub>-alkynyl, C<sub>6</sub>-C<sub>18</sub>-aryl-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>6</sub>-C<sub>18</sub>-aryl-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>1</sub>-C<sub>18</sub>-alkoxy-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>18</sub>-alkoxy-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>6</sub>-C<sub>18</sub>-aryloxy-C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>6</sub>-C<sub>18</sub>-aryloxy-C<sub>2</sub>-C<sub>18</sub>-alkenyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>1</sub>-C<sub>18</sub>-alkyl, and C<sub>3</sub>-C<sub>8</sub>-cycloalkyl-C<sub>2</sub>-C<sub>18</sub>-alkenyl or

the radicals R<sup>8</sup> and R<sup>9</sup> form, together with the carbon to which they are bonded, an unsubstituted or substituted or a heteroatom-containing cycloalkylidene, and

m and n are, independently of one another, 0 or 1, and the following applies to the radical R<sup>10</sup>:

if m is 0 then the radical R<sup>10</sup> is selected from the group consisting of substituted or unsubstituted C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>2</sub>-C<sub>18</sub>-alkenyl or C<sub>2</sub>-C<sub>18</sub>-alkynyl, substituted or unsubstituted C<sub>6</sub>-C<sub>18</sub>-aryl, C<sub>3</sub>-C<sub>18</sub>-heteroaryl, substituted or unsubstituted silaalkyl or silaaryl, and

if m is 1 then the radical R<sup>10</sup> is selected from the group consisting of substituted or unsubstituted aryl, substituted

or unsubstituted C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>2</sub>-C<sub>18</sub>-alkenyl or C<sub>2</sub>-C<sub>18</sub>-alkynyl.

3. The process as claimed in claim 1,

wherein the enzyme with hydrolytic activity is selected from the group consisting of a lipase and an esterase..

4. The process as claimed in claim 1,

wherein the enzyme is employed in a manner selected from the group consisting of directly and in immobilized form.

5. The process as claimed in claim 1,

wherein the enzyme to dioxolanone/oxathiolanone derivative ratio, calculated as molar ratio between enzyme and dioxolanone/oxathiolanone derivative, is from 1:1 000 to 1:50 000 000.

6. The process as claimed in claim 1,

wherein the nucleophile is an oxygen-containing nucleophile.

7. The process as claimed in claim 6,

wherein the oxygen-containing nucleophile is selected from the group consisting of a lower unbranched alcohol and water.

8. The process as claimed in claim 7,

wherein the lower unbranched alcohol is selected from the group consisting of methanol and ethanol.

9. The process as claimed in claim 1, which is carried out in the presence of a cosolvent.

10. The process as claimed in claim 9,

wherein the cosolvent is selected from the group consisting of aliphatic hydrocarbons, aromatic hydrocarbons, halogenated hydrocarbons, ethers, alcohols, esters, acetonitrile and mixtures thereof.

11. The process as claimed in claim 1,

wherein the reaction is carried out at temperatures between 0 and 75°C.

12. The process as claimed in claim 1,

wherein the reaction is carried out for between 10 minutes and 7 days.

13. The process as claimed in claim 1,

wherein the uncleaved enantiomer is isolated by removing the byproducts of the reaction and the solvent.

14. The process as claimed in claim 13,

wherein the byproducts are removed by a manner selected from the group consisting of extraction and distillation.